EREP QUARTERLY PROGRESS REPORT

1 FEBRUARY to 30 APRIL 1974

PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA

EXPERIMENT PROPOSAL NO. 385

CONTRACT NO. CC-30281A

BREVARD COUNTY PLANNING DEPARTMENT

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EREP PROGRESS REPORT

Covering the period 1 February to 30 April 1974

PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA

Proposal No. 385

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1 May 1974

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INTRODUCTION

The work described in this report is a continuation of analysis of SL-2 data.

URBAN LAND USE

Lakeland

Work has continued on use of EREP and ERTS data for land use mapping of Lakeland. Comparison of the three types of satellite data available for this city has led us to the conclusion that EREP photography provides the most detailed information, followed by ERTS MSS data, then EREP MSS data. The relative usefulness of EREP MSS data may improve in the future when tapes with reduced noise are available.

A land use map of Lakeland prepared from EREP photography without use of ground truth was presented in our preceding progress report.[1] That map has now been modified as a result of comparisons with aircraft photography and discussions with Lakeland city planners. The new version is shown as Figure 1. The legend for this and the other land use maps in this report is given as Table 1, which represents a slightly modified version of the Anderson, Hardy, Roach classification system.[2]

The procedure which we have found most satisfactory for preparation of urban land use maps of this type is based on use of S190B photography as a starting point. In this case, the 9-inch enlargement of the S190B

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1. EREP Quarterly Progress Report
1 November 1973 to 31 January 1974

2. James R. Anderson, Ernest E. Hardy and John J. Roach
A Land-Use Classification System for Use with Remote Sensor Data
Geological Survey Circular 671

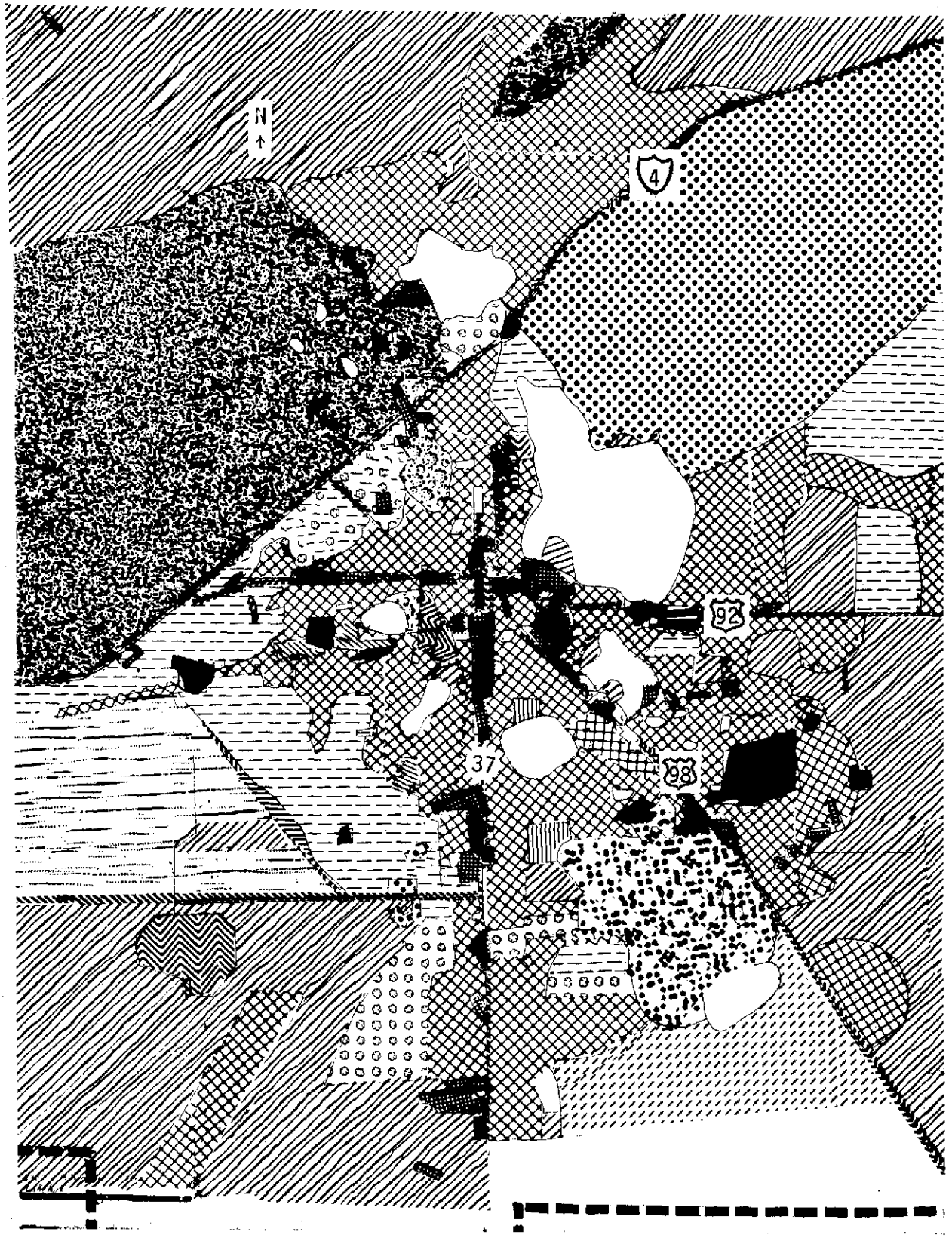

FIGURE 1. LAND-USE MAP OF LAKELAND
PREPARED FROM EREP PHOTOGRAPHY

TABLE 1

LAND-USE CATEGORIES:

Level 1	Level 2
01. Urban and built-up land	01. Residential a. Rural residential b. Mobile-home parks 02. Commercial and services 03. Industrial 04. Extraction a. Phosphate mines b. Reclaimed phosphate mines 05. Transportation 07. Strip 09. Open 10. Institutional & recreational
02. Agricultural land	01. Cropland and pasture a. Muck farms (vegetables) 02. Groves a. Primarily citrus
03. Rangeland	01. Grass
04. Forest Land	01. Deciduous 02. Evergreen (pine) 03. Mixed
05. Water	01. Streams and waterways 02. Lakes 03. Other (Gulf of Mexico)
06. Nonforested Wetland	01. Vegetated 02. Bare
07. Barren Land	03. Sand other than beaches

Mixed Categories

Open and Citrus Groves

Groves and Lakes

Lakes, Groves & Vegetated Wetlands

photography was enlarged in a Variscan viewer to a scale of approximately 1/41,000 for the working map, which was prepared by tracing on a transparent material placed on the Variscan screen. Geometric features were traced on the overlay. The geometric and visible radiance information provided by this photography are found to provide most of the urban information available from the EREP photography. The color ir photography is then used to provide further information, particularly land-use information which cannot be identified by geometric features. The above information is then supplemented by further interpretation of the remaining photography. The map so prepared, Figure 1, has been reduced for presentation in this report to a scale of approximately 1/113,000.

As indicated above, the high resolution of the S190B photography makes it particularly useful for discerning the geometric features associated with urban area. In particular, street patterns plus radiance information make straightforward the delineation of residential sectors of at least medium density. Lower density residential sectors are doubtful.

Street patterns can be used to distinguish small urban areas.

Industrial-commercial sectors can be identified by higher radiance, and industrial sectors can be distinguished from commercial sectors sometimes, but not reliably. Further identification requires ground truth information.

It was found that numerous mobile-home parks were observed on the S190B photography but were not distinguishable from commercial sectors.

The S190B photography is excellent for locating major roads and streets.

The high radiance of bare sand causes it to show clearly.

As indicated above, the color ir photography is the most useful type for identification of non-urban land uses. It and the 0.7-0.8 μm and 0.8-0.9 μm bands readily delineate visible water surfaces.

The color photography is comparable in usefulness to the color ir photography except that it probably is slightly more useful for urban features and slightly less useful for non-urban land uses.

The 0.6-0.7 μm band also is particularly useful for urban features and roads.

For comparison, the EREP photography-based land use map of Lakeland prepared without use of ground truth information is shown as Figure 2. (This is a repetition from our preceding progress report.) Changes which resulted from the "ground-truthing" process are shown in Figure 3. The larger sectors correspond to old phosphate mines, undergoing reclamation. Other changes represent primarily:

(1) distinctions between commercial and industrial

(2) identification of mobile-home parks

(3) changes in classification of undeveloped land.

The EREP MSS computer-mapped land use map of Lakeland as modified by ground truth information is shown as Figure 4.

PHOSPHATE MINES

Lakeland and the region to the south of it have numerous phosphate mines. Phosphate mining is a strip-mining operation which leaves bare sand exposed. Bare sand has high reflectivity and is easily observed by any of the three satellite systems discussed herein. Hence, any of these three systems could be used effectively for monitoring the phosphate mining operations with regard to extent and locations.

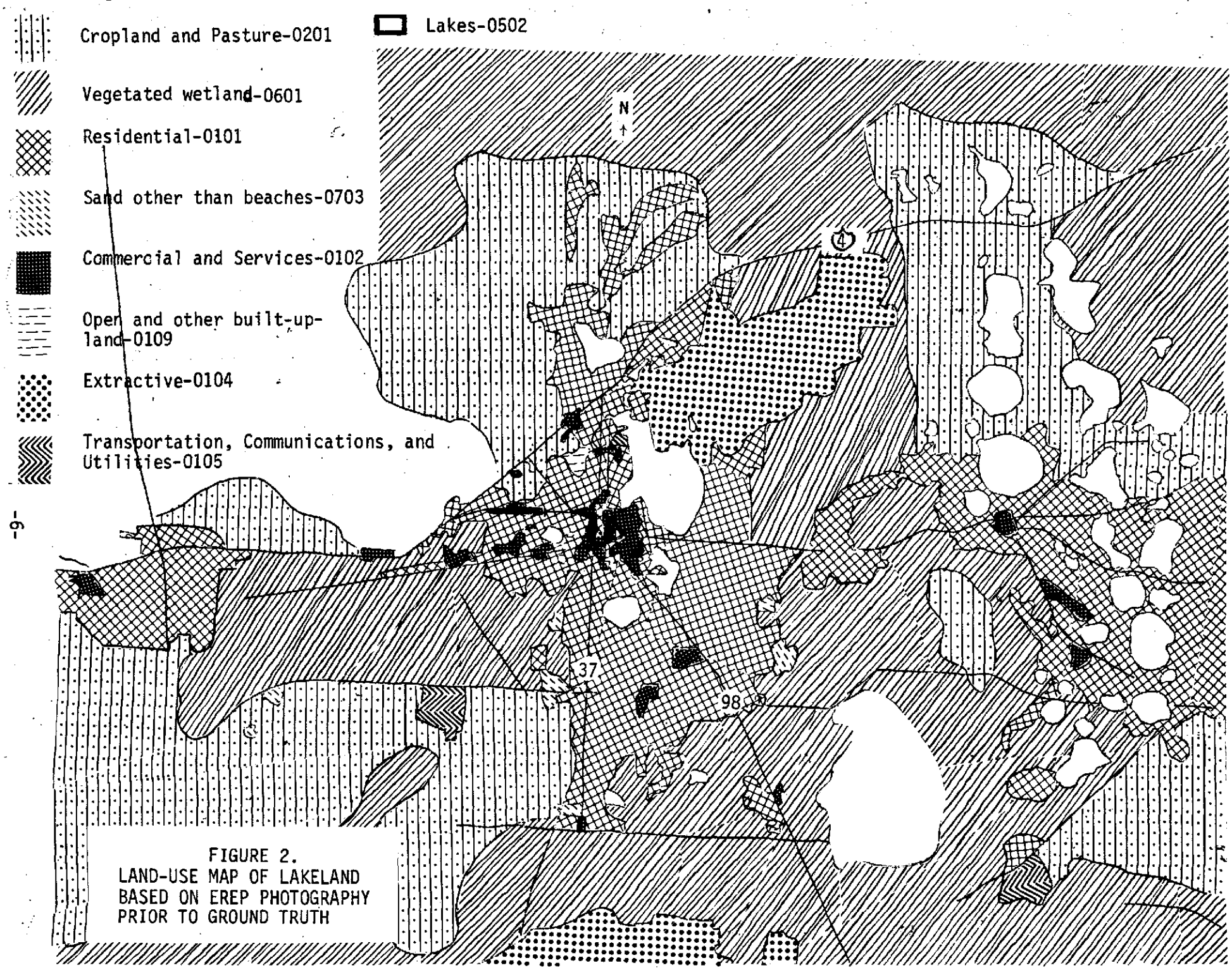

FIGURE 2.
LAND-USE MAP OF LAKELAND
BASED ON EREP PHOTOGRAPHY
PRIOR TO GROUND TRUTH

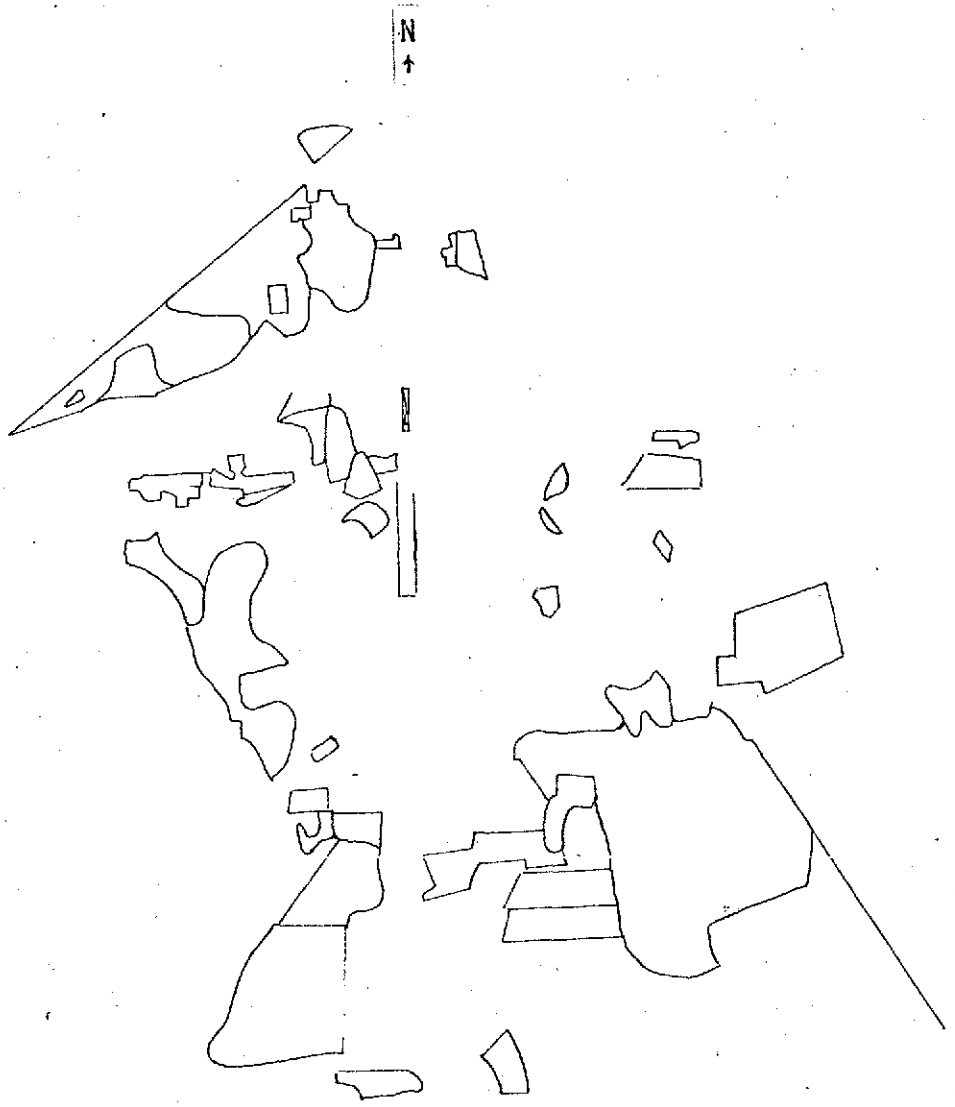

FIGURE 3. LAKELAND
LAND-USE CHANGES RESULTING FROM GROUND TRUTH OBSERVATIONS

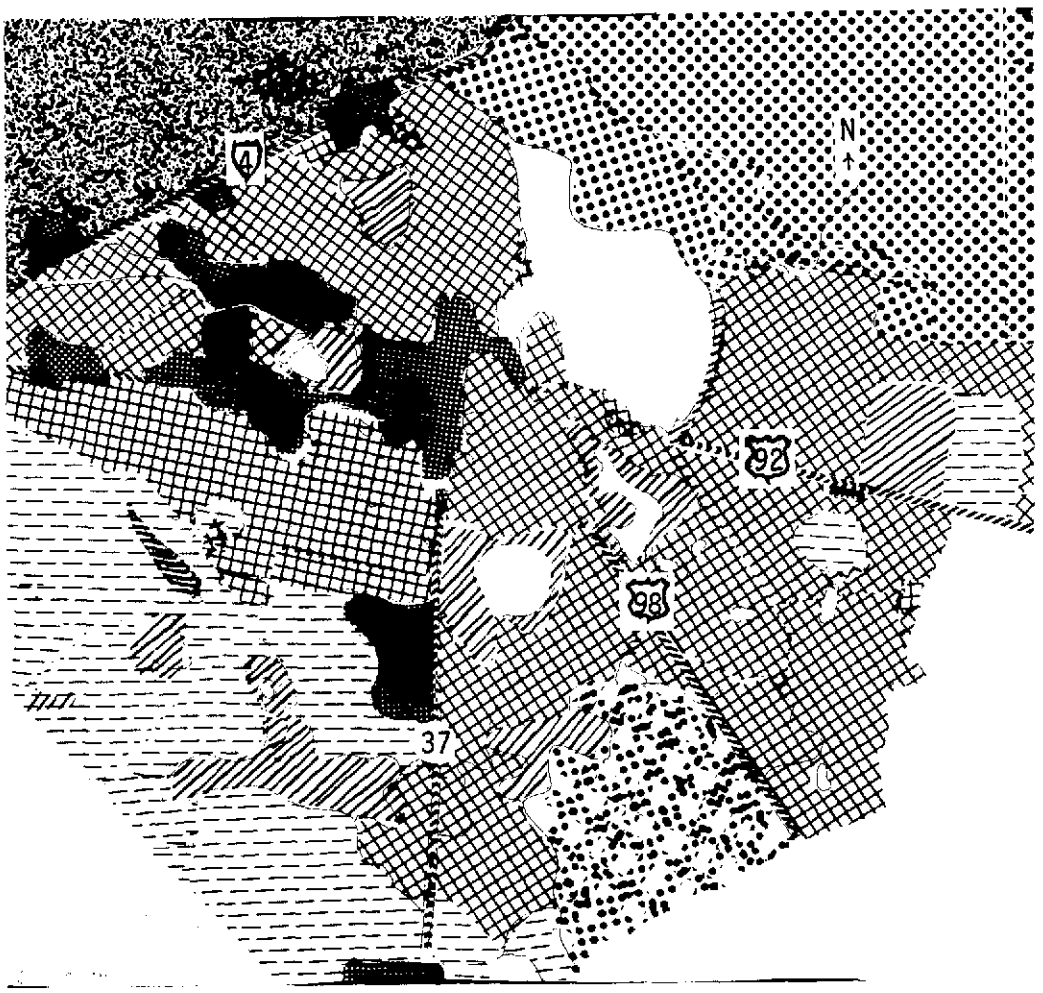

FIGURE 4. LAKELAND
EREP MSS LAND-USE MAP

QUANTIZED IMAGES

An Optronics drum-type microdensitometer has been used to quantize the S190B photography of Lakeland in an attempt to produce thematic maps of significant urban features.

Figure 5 is intended to show the distribution pattern of commercial, industrial, and bare sand (phosphate mines) activity.

Figure 6 is intended to show the distribution of high intensity regions: commercial, industrial, phosphate mines, and high density residential. In Figures 6 and 7, the strip along the northwest edge of the figure which appears as medium intensity is due to a thin cloud.

In Figure 7, black is intended to represent commercial-industrial-phosphate mines-high density residential sectors, gray is intended to represent residential sectors, and blank is intended to represent lakes and undeveloped sectors.

This method appears to be useful in presenting general patterns, but there are errors in some details. For example, in this single-band use, some undeveloped sectors have radiance characteristic of residential sectors.

LAKE COUNTY

EREP photography has been used to prepare a land-use map of Lake County, shown as Figure 8. Our currently preferred procedure for preparing such a generalized map for a non-urban area differs from that for an urban area in that, for the non-urban mapping, it is found better to start with the color ir photography. In this case, the 9-inch photography was enlarged by a factor of three on a Variscan viewer and a tracing made of the land-use patterns at the resulting scale of approximately 1/242,000 (subsequently reduced for reproduction in this report to approximately 1/332,000). Nine-inch transparencies

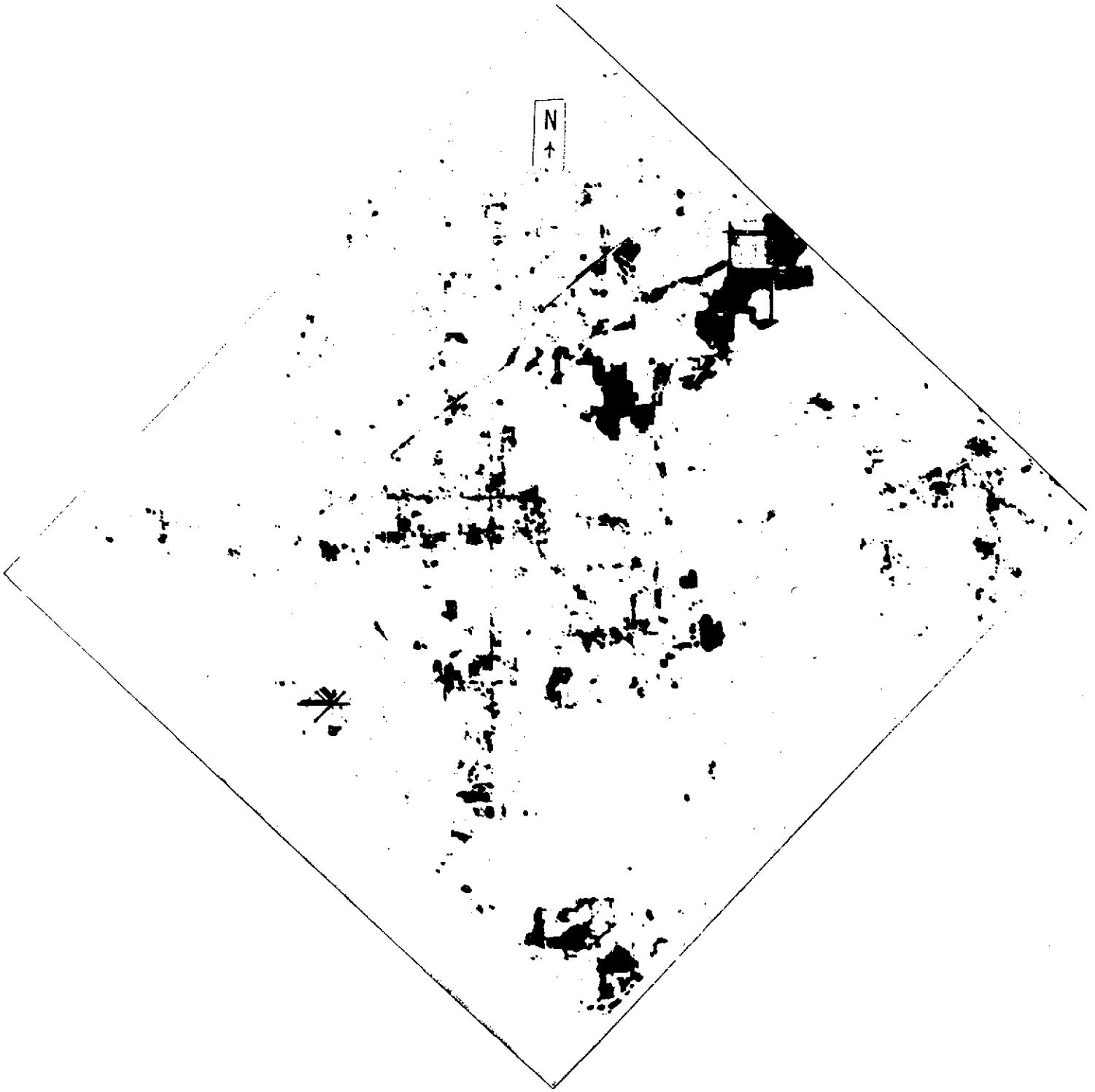

FIGURE 5. LAKELAND
QUANTIZED S190B PHOTOGRAPHY
COMMERCIAL-INDUSTRIAL-PHOSPHATE MINES

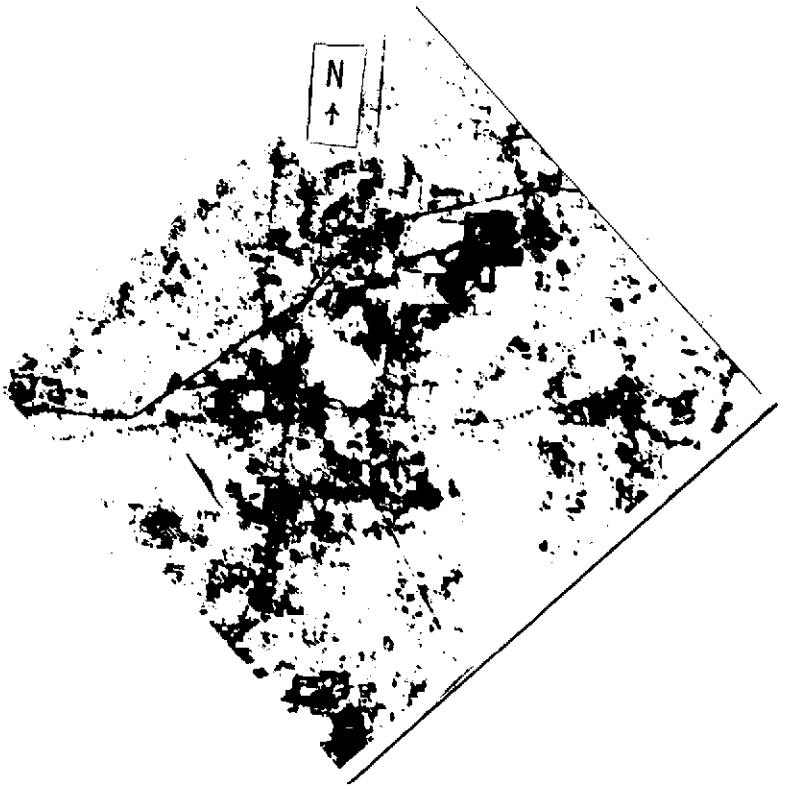

FIGURE 6. LAKELAND
QUANTIZED S190B PHOTOGRAPHY
COMMERCIAL-INDUSTRIAL-PHOSPHATE MINES-
HIGH DENSITY RESIDENTIAL

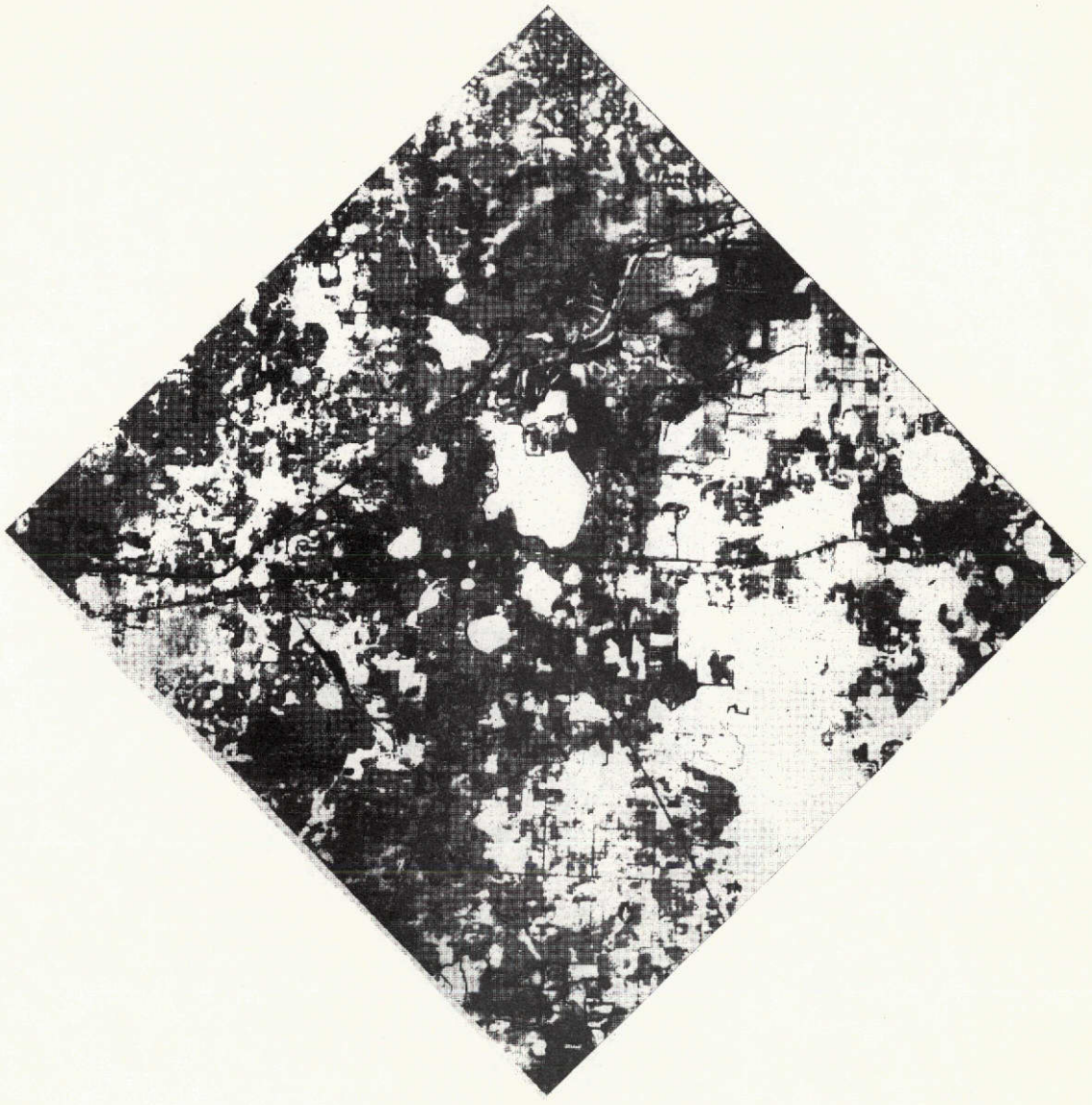

FIGURE 7. LAKELAND
QUANTIZED S190B PHOTOGRAPHY
BLACK: COMMERCIAL-INDUSTRIAL-PHOSPHATE MINES-HIGH DENSITY RESIDENTIAL
GRAY: RESIDENTIAL
BLANK: LAKES-UNDEVELOPED

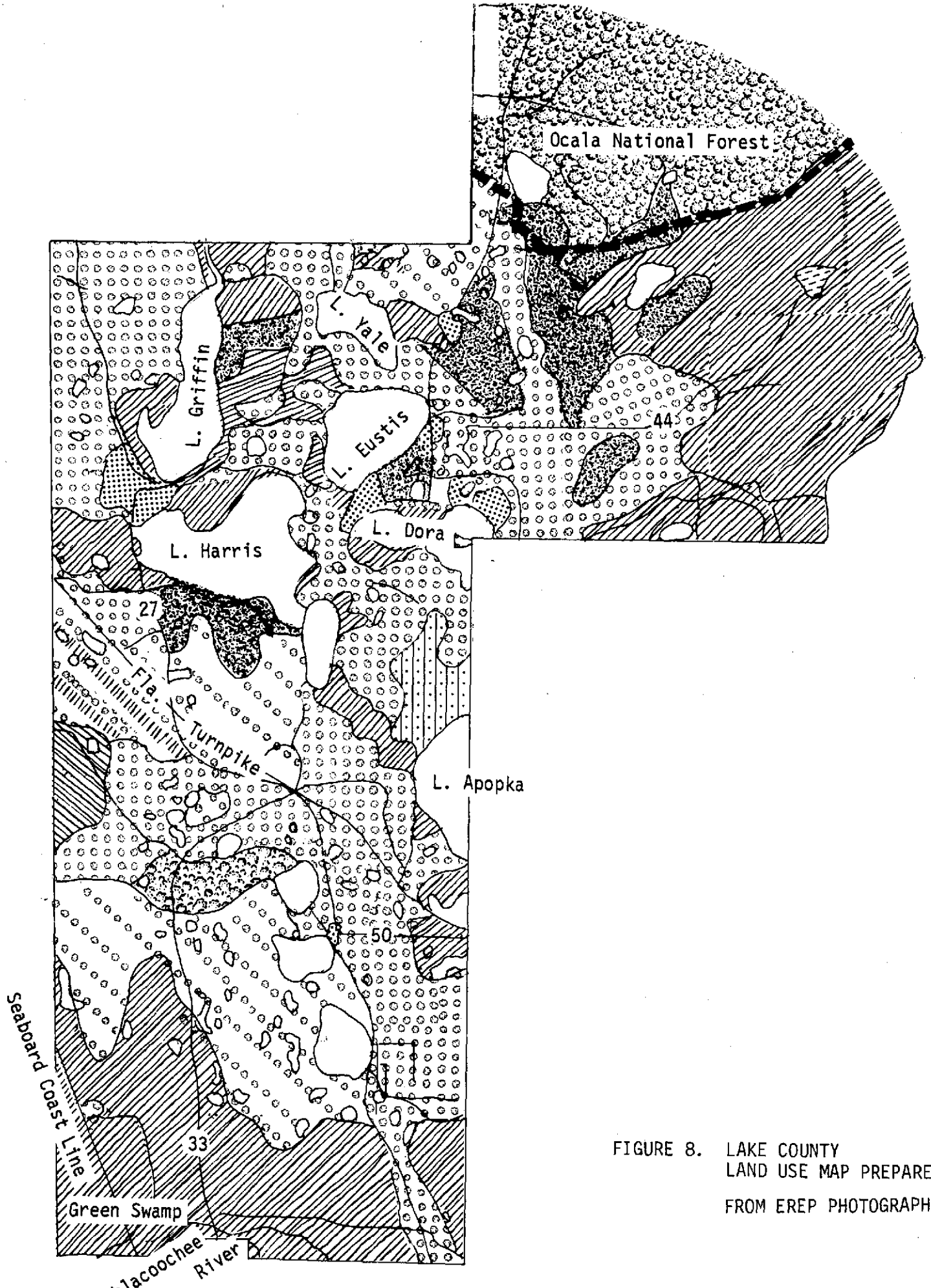

FIGURE 8. LAKE COUNTY
LAND USE MAP PREPARED
FROM EREP PHOTOGRAPHY

of the other S190A bands can then be projected directly on the tracing for modification of the tracing and information from the S190B also is transferred to the tracing.

The land-use patterns are mostly clear-cut, especially with the color ir film, but the interpretation of the land use for each sector is open to some question. USGS topographic maps (7.5 minute) have provided the only ground truth checking and appropriate map modifications will be made later.

A small portion of the northeast corner of the county is omitted from this map as it was not included in the photograph.

It will be noted there are sectors identified as grove-lakes and grove-wetlands-lakes. These designations were used because from the photography there appears to be such an intimate "mixture" of lakes and groves (or lakes, wetlands, and groves) that no other designation seems appropriate.

Computation of areas, for that portion of the county mapped, gives the relative areas listed in Table 2. The portion of the county omitted from this map is mostly forest, with some wetlands.

TABLE 2. LAKE COUNTY
RELATIVE AREAS (from Figure 8)

Urban	1%
Agricultural	33%
Unclassified	6%
Citrus groves	27%
Forest	11%
Lakes	11%
Vegetated wetland	30%
Mixed: groves & lakes	11%
Mixed: groves, lakes & vegetated wetlands	2%

ACKNOWLEDGEMENTS

The Variscan viewer and Optronics microdensitometer used in this work are located in the Earth Resources Analysis Facility at Kennedy Space Center. Joseph Bartoszek, of that facility operated the microdensitometer.